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2005

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Determination of Mid-Depth Synoptic (10-Day) Circulation of the North Atlantic Ocean from Argo Position Data Using the Optimal Spectral Decomposition Method

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Great advantages of spectral representation in ocean observation and modeling are demonstrated in this paper. For observation, two-scalar (toroidal and poloidal) spectral representation is used to reconstruct three-dimensional ocean flow from noisy data in an open domain. This approach includes: (a) a boundary extension method to determine normal and tangential velocities at an open boundary, (b) establishment of homogeneous open boundary conditions for the two potentials with a spatially varying coefficient κ, (c) spectral expansion of κ, (d) calculation of basis functions for each of the scalar potentials , and (e) determination of coefficients in the spectral decomposition of both velocity and κ using linear or nonlinear regressions.

Temporally varying data of the location of the ARGO floats (1999-2004) are used to construct the mid-depth (1,250 m) circulation of the North Atlantic Ocean every 10 days. An optimization scheme with iteration and regularization is proposed to obtain unique and stable solutions. The synoptic velocity filed computed using the optimal decomposition (OSD) method is comparable to the existing depictions of the North Atlantic ocean circulation. This shows the capability of the OSD technique for Lagrangain analysis and data assimilation.

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Oral Presentation is requested.

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